Developing Early Corrective Actions to Address Hypoxia in Hood Canal

Dave Christensen, Hood Canal Coordinating Council
Anne Criss and Duane Fagergren, Puget Sound Action Team

Keywords: Hood, Canal, hypoxia, corrective, actions

Significant fish kills in Hood Canal in 2002 and 2003 heightened awareness about hypoxia problems. Congressman Norm Dicks secured $500,000 of federal funding to implement early corrective actions, and Governor Gary Locke included an additional $100,000 in the Washington State budget to fund early corrective action projects. The goal was to begin to address factors contributing to hypoxia concurrently with scientific study.

Although intensive scientific study was underway, the Hood Canal Dissolved Oxygen Program Integrated Assessment and Modeling (HCDOP-IAM) task would not produce conclusions in a timeframe needed to begin to develop projects. The State needed to prioritize which projects should be funded and to do it quickly, so that project implementation could begin immediately.

The Puget Sound Action Team was charged with coordinating state agency efforts to develop early corrective action projects. The Action Team partnered with the Hood Canal Coordinating Council (HCCC) to facilitate the participation of Hood Canal local and tribal governments in a preliminary study that would guide funding decisions. The goal was to conduct a review of available data, complete a preliminary assessment of human contributions to hypoxia in Hood Canal, and identify appropriate early corrective measures.

The PSAT and HCCC sponsored two full-day workshops, inviting more than 30 participants representing local, state, federal and tribal agencies and non-governmental organizations. The workgroup started by identifying what they perceived to be the most significant anthropogenic contributions to hypoxia. Next, participants brought together all available data and studies, including studies and assessments from other coastal areas experiencing hypoxia.

The workgroup concluded that nitrogen inputs from anthropogenic sources were likely to be contributing to the increasingly severe marine hypoxia in Hood Canal. This conclusion was based on previous studies including some of Hood Canal itself (Newton et al. 1995; Bricker et al. 1999). The workgroup acknowledged that there could be many human activities contributing to hypoxic conditions in Hood Canal that would not result in nitrogen inputs. The types of impacts not associated with nitrogen inputs include hydrologic changes from water diversions, road building, and impervious surfaces; changes to climate; and development impacts in the nearshore environment, shorelines and in estuaries, and resultant changes in ecosystem processes in those areas.

The workgroup was split into topical subgroups with each subgroup assessing a different potential anthropogenic source of nitrogen. Each topical subgroup was tasked to come to a consensus recommendation on how best to quantify nitrogen inputs for their topical area. The subgroups also identified the best sources of data and related studies to use to generate an estimated loading into Hood Canal. The results were compiled by the Action Team and HCCC staff.

The estimates of potential anthropogenic nitrogen inputs into Hood Canal, defined as the area draining into Hood Canal south of the Hood Canal Bridge, were:

- Human sewage—39 to 241 tons
- Stormwater runoff—12 to 24 tons (includes lawn fertilizers)
- Chum salmon carcasses—16 to 24 tons
- Agricultural waste—18 to 22 tons
- Forestry-related inputs—0.5 to 5 tons
- Point source discharges—0.3 to 3 tons

The Action Team and HCCC staff then worked directly with agencies and organizations that would lead implementation of corrective actions projects. From meetings with local and tribal officials, some key limitations were identified. Because of the uncertainty that exists with the causality of hypoxia in Hood Canal, there was the most support for voluntary projects. Further, agencies expressed a need for developing incentives to address nitrogen and pollution inputs. Projects that addressed multiple water quality parameters or multiple environmental issues in addition to reducing nitrogen loading to Hood Canal were identified as preferable. Finally, there was almost universal agreement that projects needed to have a strong educational and outreach component, as individual behaviors would have to be addressed in non-regulatory approaches to see measurable water quality improvements.

The final document was produced, the Preliminary Assessment and Corrective Actions (PACA) Plan (Puget Sound Action Team and Hood Canal Coordinating Council 2004). The Action Team then issued Requests for Proposals based on the top four human nitrogen contributions identified in the PACA Plan. Projects proposed for funding included those addressing nitrogen from human sewage, stormwater, chum salmon carcasses and agricultural practices.

The process used to develop the PACA Plan was collaborative and represents a first cut at understanding the nitrogenous anthropogenic impacts to Hood Canal. Projects funded implementing the PACA Plan represent a good first step in improving water quality and the environmental health of Hood Canal. These early corrective actions projects will also help to inform future decisions and options as scientific studies improve our understanding of the ecosystem. In this way, the scientific study and early actions are complementary arms of the overall comprehensive Hood Canal Dissolved Oxygen Program.

The Hood Canal Low Dissolved Oxygen, Preliminary Assessment and Corrective Actions Plan, Version 1 can be accessed online at: http://www.psat.wa.gov/Programs/hood_canal/hc_paca.htm

References

Bricker, S.B., C.G. Clement, D.E. Pirhalla, S.P. Orlando, and D.R.G. Farrow. 1999. *National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation's Estuaries.* NOAA, Special Projects Office and the National Centers for Coastal Oceanic Science. Silver Spring, MD.

Puget Sound Action Team and Hood Canal Coordinating Council. 2004. Hood Canal Low Dissolved Oxygen, Preliminary Assessment and Corrective Actions Plan. Version 1. May 6, 2004.

Newton, J.A., A.L. Thomson, L.B. Eisner, G.A. Hannach, and S.L. Albertson. 1995. Dissolved oxygen concentrations in Hood Canal: Are conditions different than forty years ago? **In**: *Puget Sound Research '95 Proceedings.* Puget Sound Water Quality Authority, Olympia, WA. pp. 1002-1008